BARBER COLMAN

INSTRUCTION MANUAL

BARBER-COLMAN COMPANY
Industrial Instruments Div. • Rockford, Ill., U.S.A.

IN 1230-1

MODEL 4001-1
MODEL 4501-1

FILLED SYSTEM THERMOMETERS

INTRODUCTION

This instruction manual is designed to help you secure maximum benefits from your new Series 4000 Filled System Thermometer. It should be given to persons respnsible for installation and maintenance of this instrument.

Your Barber-Colman factory trained field engineer is always available for further help in the solution of your control problems. Offices are located in all principal cities.

This manual includes instruction sheets numbered as follows:

6425	(F-8526)
6426	(F-8531)
6428	(F-8533)

Model 401P Instruction Book

BARBER-COLMAN COMPANY
Industrial Instruments Division

Litho in U.S.A.

F-12566

BARBER COLMAN

Wheelco Instruments

INSTRUCTION SHEET NO. 6425

THERMOTROLS

4000 Series Thermometers

INSTALLATION AND MAINTENANCE INSTRUCTIONS

UNPACKING INSTRUMENT

This Wheelco Instrument and its associated equipment have been carefully manufactured and packed at the factory. Remove the instrument and accessories from the packing box and check items against the packing slip. If the equipment is found to be damaged in transit, report extent of damage to the carrier immediately. Repack in original packing box until ready for installation.

CAUTION:

Handle with care.
Safeguard instrument from shock.
Avoid oil accumulation and corrosive atmospheres.
Keep instrument temperature under 130°F.

MOUNTING INSTRUCTIONS

Locate the instrument to avoid shock, excessive vibration, moisture and temperatures over 130°F. Avoid furnace walls, radiation of heat, machine frames and outside walls. Provide suitable shelter to avoid moisture and temperature extremes if installed outdoors.

For surface mounting the instrument is provided with 2 posts with lugs mounted on the rear of the case. These posts are furnished only when a surface mounting is specified.

The flush or panel mounting is the type normally supplied and is installed by inserting the instrument through a hole cut in the panel according to the dimensions given on the mounting dimension sheet. The flush mounting rim on the side of the case is fastened to the front of the panel.

POWER WIRING

Remove the chart or scale supporting plate by loosening the lower right hand screw, lifting the plate carefully off the supporting posts and dropping it down. CAUTION: Do not damage or force pen or indicator arm. If desired, reposition red control point indicator using control set knob. To further facilitate wiring, the chassis may be removed by grasping the side plates of the chassis and pulling it forward.

Check the rating plate on the side of the chassis for the supply voltage and frequency. Connect proper voltage and frequency to terminals L1 and L2. Supply voltage should be 105 to 125 VAC or 210 to 250 VAC depending on chassis specifications. Run all wiring in rigid conduit, BX or Greenfield, in accordance with the recommended electrical code. Use properly fused switches, see wiring diagram.

Solid wire (14 ga.) is recommended for instrument wiring. If stranded wire is used, tin the end to provide secure connections. Position the wires so they do not interfere with control chassis or the housing gaskets. Ground the instrument case; a grounded conduit system is usually sufficient.

MEASURING SYSTEM AND CAPILLARY TUBING

The thermal system consists of a bulb containing a measured amount of mercury which is connected to a bourdon coil in the instrument by means of capillary tubing. As the bulb is heated, the expanding mercury exerts pressure on the bourdon coil to actuate the pen arm or indicator.

The capillary tube is protected by a flexible type 347 stainless steel armor which should be installed so that it is not subject to any constant abrasive action which would wear it through and damage the capillary. Care should be taken not to run the flexible armor in contact with the hot walls of an oven or subject it to any extremes of temperature along its length. The fine bore of the capillary makes negligible any error that might be caused by ordinary variations of temperature along its length, but extremes should be avoided. Handle carefully, do not kink the tubing.

Variations of temperature in the case of the instrument are compensated by means of a steel tube having a close fitting core of invar rod. As the temperature in the case increases the steel tube will expand more than the invar core. The resulting clearance is exactly the same volume as the increased volume of mercury, thereby having a null effect on the indicator. This compensator is an integral part of the thermal system and requires no attention on the part of the user.

ADJUSTMENTS AND CHECKS

After the instrument has been installed, remove the string fastening the pen arm to the pen lifter. Attach the proper chart, setting the proper time by aligning with the red index on the chart plate. Fill the pen with ink and check to see that the clock is moving the chart properly. As most chart drives are electric, the line terminals will have to be powered for this check.

If desired, a calibration check can be made in the low temperature range. Insert the bulb in a vessel of water that is being agitated and at a known temperature (say 75 F. as checked with an accurate thermometer). See that the indicator or pen arm registers correctly. If not, adjust the screw on the indicating arm to reset.

For this calibration check, it is not necessary to have the instrument powered. It is suggested that the control index be set to the maximum high point on the scale during this check.

SERVICING

As the measuring system is a hermetically sealed unit, little servicing is required in the field. In most cases, if the measured temperature is known to be in error, resetting the pen or indicating arm will bring in calibration for the entire scale range. Check reading at a low (1/4 of scale) and at a high (3/4 of scale) point of the scale and

adjust the fine thread screw at the pen arm for the correct reading. A small error can be split between the two points. If the error is large, a range span adjustment can be made by adjusting the ratio arm at the bourdon coil. If the reading is low, travel of the connecting link can be increased by raising the position of the link on the ratio arm. Recheck calibration at both the low and high points if an adjustment is made.

If the system has developed a leak which causes calibration to get continually worse, it will require a new system from the factory to correct.

To remove the old system:

1) Remove the chart plate.
2) Detach the connecting link from its pivot on the pen or indicator arm.
3) Remove the two screws holding the bourdon coil.
4) Remove the four screws holding the flanged fitting in the back of the case.
5) Pull the flexible armor and bulb out through the case.

Install the new system following the reverse procedure. CAUTION: Do not change the setting of the connecting link pivot on the bourdon coil arm since this will shift calibration and create an error in the new system.

After installing, insert the bulb in a vessel of liquid at a known temperature and adjust the fine thread screw on this pen arm, if necessary.

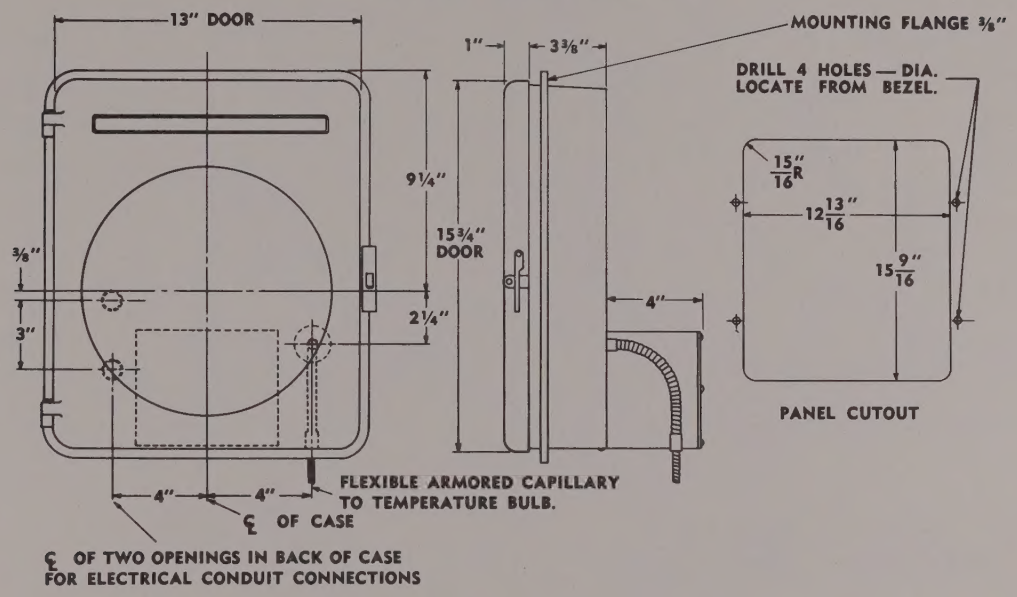
Wheelco Instruments

INSTRUCTION SHEET NO. 6426

THERMOTROLS
4000 Series Thermometers

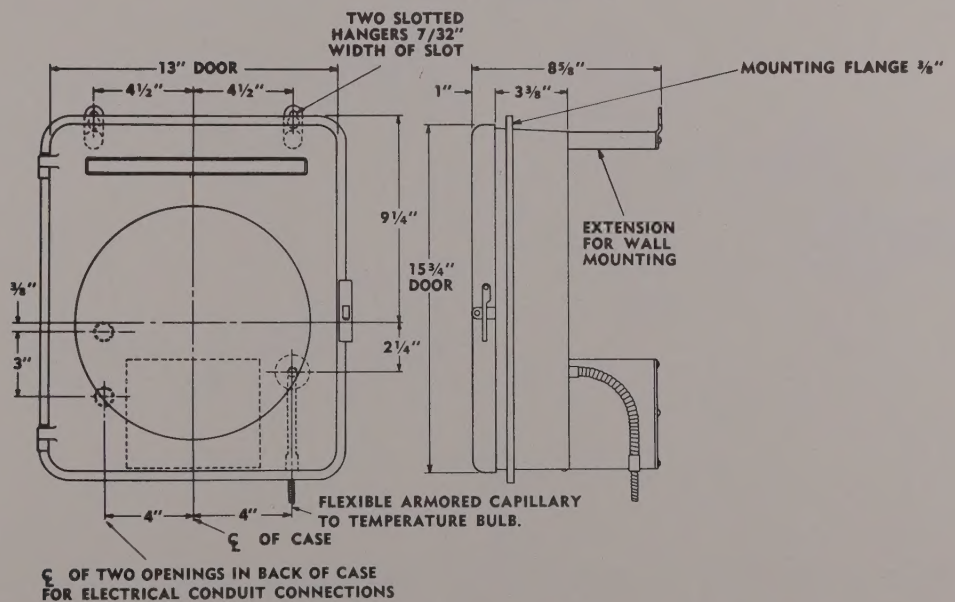
MOUNTING DIMENSIONS

Flush or Panel Mounting



ALL BACK CONNECTED

Surface Mounting



ALL BACK CONNECTED

Wheelco Instruments Division

BARBER-COLMAN COMPANY
ROCKFORD, ILLINOIS, U. S. A.

F-8531

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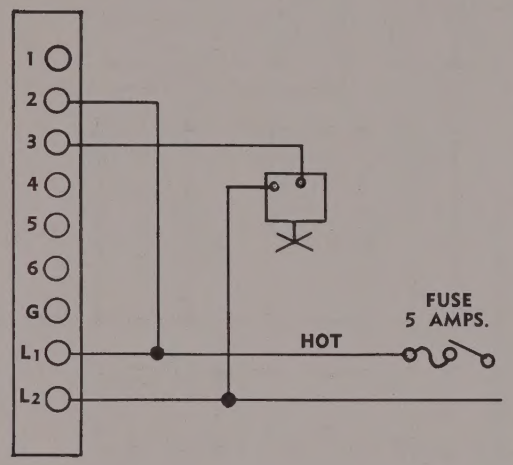
Wheelco Instruments

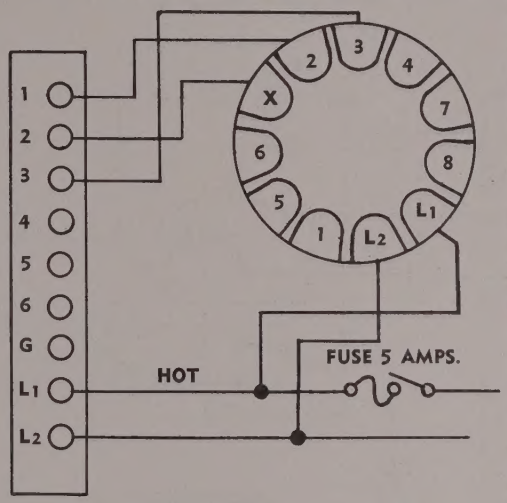
INSTRUCTION
SHEET NO. 6428A

EXTERNAL WIRING DIAGRAMS

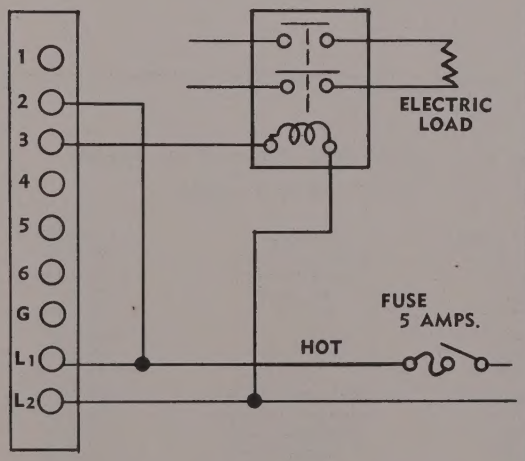
TYPE 401 CONTROL



SOLENOID VALVE



BARBER-COLMAN WHEELCO
TYPE MF REVERSIBLE CONTROL MOTOR



ELECTRIC CONTACTOR

NOTES:

1. Instrument relay rating 5 AMPS.-230V., 10 AMPS-110V. non-inductive load.
2. MF Control Motor wiring shown for CCW rotation on call for heat. Interchange term. 2 and 3 at the motor for CW rotation.

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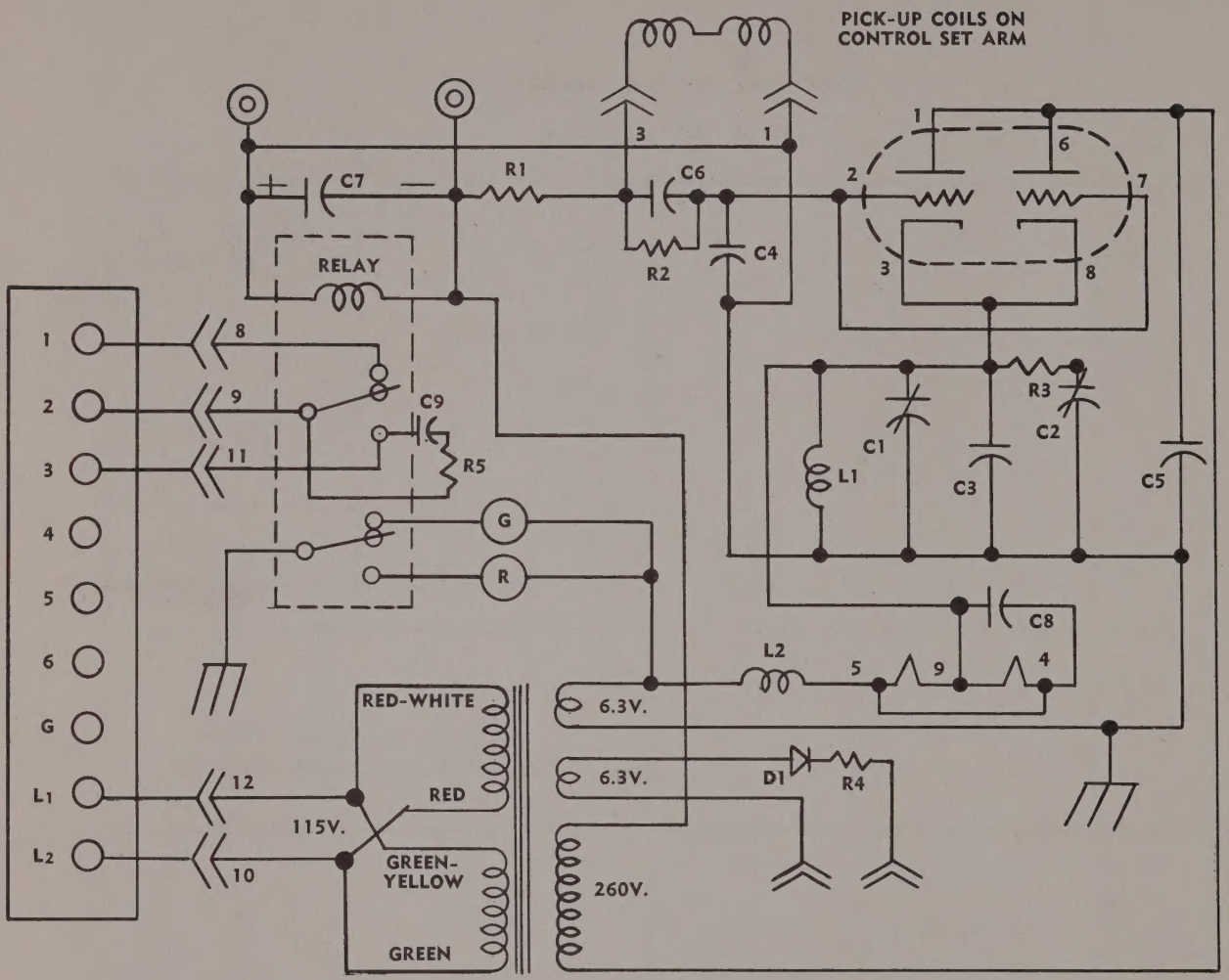
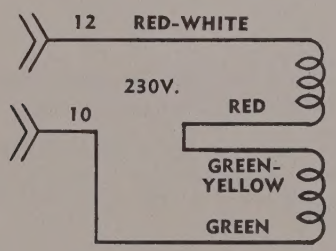
INTERNAL WIRING DIAGRAMS

TYPE 401 CONTROL





NOTES:

1. INDICATES PLUG PINS ON CHASSIS
2. INDICATES TEST JACKS

Drw'g Symbol	Value	Part No.
C1	8-50 mmf Var.	39-105
C2	1-8 mmf Var.	39-111
C3	47 mmf	39-080
C4	15 mmf	39-109
C5	.0047 mfd	39-088
C6	.02 mfd	39-062
C7	8 mfd	CYZR 327-1
C8	.001 mfd 600 V.	39-063
D1	Selenium Rectifier	37-009
L1	Oscillator Coil	41-002
L2	Filament Choke	30-083
R1	8.2 meg.	40-089
R2	4.7 meg.	CYZR 170-18
R3	560 Ω	CYZR 170-52
R4	27 K	CYZR 170-7
Transformer	60 C	30-065
	25 C	30-066
Tube	12 AU 7	EYZP 70-9
Relay		38-139
R5	1000 Ω	CYZR 172-10
C9	.1 mfd	39-057

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